

CLAIMS

1. A semiconductor manufacturing apparatus, comprising:
 - a treating unit that treats a substrate to manufacture thereon a semiconductor device;
 - a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit;
 - a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid;
 - a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage;
 - a first shut-off valve disposed on the fluid supplying channel on an upstream side of the massflow controller; and
 - a second shut-off valve disposed on the fluid supplying channel on a downstream side of the massflow controller; wherein

the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal;

a storing unit is provided, that stores the detected voltage outputted from the detecting unit of the massflow controller, when the first and the second shut-off valves are closed; and

a set voltage correcting unit is provided, that corrects the set voltage based on the detected voltage stored in the storing unit, in such a manner that a drift of the detected voltage is compensated when an actual flow volume of the fluid is zero.

2. The semiconductor manufacturing apparatus according to claim 1, further comprising:

a timing setting means that sets a timing at which the first and the second shut-off valves are closed, and the storing

unit stores the detected voltage outputted from the detecting unit of the massflow controller.

3. The semiconductor manufacturing apparatus according to claim 1 or 2, further comprising:

an alarm raising means that raises an alarm when the detected voltage deviates over a predetermined threshold value.

4. A semiconductor manufacturing apparatus, comprising:

a treating unit that treats a substrate under a predetermined vacuum atmosphere to manufacture a semiconductor device on the substrate;

a vacuum discharging channel connected to the treating unit;

a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit;

a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid;

a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage;

a bypass channel that diverges from the fluid supplying channel and bypasses the treating unit to reach the vacuum discharging channel;

a pressure detecting unit and a third shut-off valve that are disposed on the bypass channel in this order from an upstream side thereof; and

a set voltage correcting unit that corrects the set voltage based on a comparison between: a pace of increase of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when, at a predetermined timing, the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel; and a reference pace of increase of

detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel.

5. The semiconductor manufacturing apparatus according to claim 4, wherein

the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal; and

the set voltage correcting unit corrects the set voltage in such a manner that a span shift of the detected voltage is compensated.

6. The semiconductor manufacturing apparatus according to claim 4, wherein

the set voltage correcting unit corrects the set voltage based on a comparison between: a plurality of paces of increase obtained when the massflow controller is set at a plurality of predetermined flow volumes; and a plurality of reference paces of increase obtained when the massflow controller calibrated in a reference state is set at a plurality of predetermined flow volumes.

7. A semiconductor manufacturing apparatus, comprising:

a treating unit that treats a substrate under a predetermined vacuum atmosphere to manufacture a semiconductor device on the substrate;

a vacuum discharging channel connected to the treating unit;

a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit;

a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid;

a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage;

a bypass channel that diverges from the fluid supplying channel and bypasses the treating unit to reach the vacuum discharging channel;

a first shut-off valve disposed on the fluid supplying channel on an upstream side of the massflow controller; and

a pressure detecting unit disposed on the bypass channel; and

a set voltage correcting unit that corrects the set voltage based on a comparison between: a pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the first shut-off valve is closed under a condition wherein, at a predetermined timing, the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed; and a reference pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the first shut-off valve is closed under a condition wherein the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed.

8. The semiconductor manufacturing apparatus according to claim 7, wherein

the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that

compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal; and

the set voltage correcting unit corrects the set voltage in such a manner that a span shift of the detected voltage is compensated.

9. The semiconductor manufacturing apparatus according to claim 7, wherein

the set voltage correcting unit corrects the set voltage based on a comparison between: a plurality of paces of decrease obtained when the massflow controller is set at a plurality of predetermined flow volumes; and a plurality of reference paces of decrease obtained when the massflow controller calibrated in a reference state is set at a plurality of predetermined flow volumes.

10. A semiconductor manufacturing method performed by a semiconductor manufacturing apparatus including: a treating unit that treats a substrate to manufacture thereon a semiconductor device; a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit; a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid; a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage; a first shut-off valve disposed on the fluid supplying channel on an upstream side of the massflow controller; and a second shut-off valve disposed on the fluid supplying channel on a downstream side of the massflow controller; wherein the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal; a storing unit is provided, that stores the

detected voltage outputted from the detecting unit of the massflow controller, when the first and the second shut-off valves are closed; and a set voltage correcting unit is provided, that corrects the set voltage based on the detected voltage stored in the storing unit, in such a manner that a drift of the detected voltage is compensated when an actual flow volume of the fluid is zero; the semiconductor manufacturing method comprising the steps of:

closing the first and the second shut-off valves;

causing the storing unit to store the detected voltage outputted from the detecting unit of the massflow controller, when the first and the second shut-off valves are closed; and

causing the set voltage correcting unit to correct the set voltage based on the detected voltage stored in the storing unit, in such a manner that a drift of the detected voltage is compensated when an actual flow volume of the fluid is zero.

11. The semiconductor manufacturing method according to claim 10, further comprising the step of:

raising an alarm when the detected voltage deviates over a predetermined threshold value.

12. A semiconductor manufacturing method performed by a semiconductor manufacturing apparatus including: a treating unit that treats a substrate under a predetermined vacuum atmosphere to manufacture a semiconductor device on the substrate; a vacuum discharging channel connected to the treating unit; a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit; a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid; a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage; a bypass channel that diverges from the fluid supplying channel and bypasses the treating unit to reach the vacuum discharging channel; a pressure detecting unit and a third shut-off valve

that are disposed on the bypass channel in this order from an upstream side thereof; and a set voltage correcting unit that corrects the set voltage based on a comparison between: a pace of increase of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when, at a predetermined timing, the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel; and a reference pace of increase of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel; the semiconductor manufacturing method comprising the steps of:

calculating a reference pace of increase of detected pressure values detected by the pressure detecting unit for a predetermined period of time, when the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel;

calculating a pace of increase of detected pressure values detected by the pressure detecting unit for a predetermined period of time, when, at a predetermined timing, the bypass channel is vacuumed, the third shut-off valve is then closed, and the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel; and

correcting the set voltage based on the comparison between the reference pace of increase and the pace of increase.

13. The semiconductor manufacturing method according to claim 12, wherein

the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal; and

the step of correcting the set voltage is carried out in such a manner that a span shift of the detected voltage is compensated.

14. The semiconductor manufacturing method according to claim 12, wherein

the step of correcting the set voltage is carried out based on a comparison between: a plurality of paces of increase obtained when the massflow controller is set at a plurality of predetermined flow volumes; and a plurality of reference paces of increase obtained when the massflow controller calibrated in a reference state is set at a plurality of predetermined flow volumes.

15. A semiconductor manufacturing method performed by a semiconductor manufacturing apparatus including: a treating unit that treats a substrate under a predetermined vacuum atmosphere to manufacture a semiconductor device on the substrate; a vacuum discharging channel connected to the treating unit; a fluid supplying channel for supplying a fluid required for a treatment of the substrate to the treating unit; a set voltage outputting unit that outputs a set voltage corresponding to a set flow volume of the fluid; a massflow controller disposed on the fluid supplying channel, that controls a flow volume of the fluid based on the set voltage; a bypass channel that diverges from the fluid supplying channel and bypasses the treating unit to reach the vacuum discharging channel; a first shut-off valve disposed on the fluid supplying

channel on an upstream side of the massflow controller; and a pressure detecting unit disposed on the bypass channel; and a set voltage correcting unit that corrects the set voltage based on a comparison between: a pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the first shut-off valve is closed under a condition wherein, at a predetermined timing, the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed; and a reference pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, the detected pressure values being detected when the first shut-off valve is closed under a condition wherein the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed; the semiconductor manufacturing method comprising the steps of:

calculating a reference pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, when the first shut-off valve is closed under a condition wherein the massflow controller calibrated in a reference state is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed;

calculating a pace of decrease of detected pressure values detected by the pressure detecting unit for a predetermined period of time, when the first shut-off valve is closed under a condition wherein, at a predetermined timing, the massflow controller is set at a predetermined flow volume to supply the fluid to the bypass channel through the fluid supplying channel while the bypass channel is vacuumed; and

correcting the set voltage based on the comparison between the reference pace of decrease and the pace of

decrease.

16. The semiconductor manufacturing method according to claim 15, wherein

the massflow controller includes: a detecting unit that detects an actual flow volume of the fluid and outputs a corresponding detected voltage; a comparing unit that compares the set voltage with the detected voltage to output an operation signal; and a flow volume adjusting unit that adjusts the flow volume of the fluid based on the operation signal; and

the step of correcting the set voltage is carried out in such a manner that a span shift of the detected voltage is compensated.

17. The semiconductor manufacturing method according to claim 15, wherein

the step of correcting the set voltage is carried out based on a comparison between: a plurality of paces of decrease obtained when the massflow controller is set at a plurality of predetermined flow volumes; and a plurality of reference paces of decrease obtained when the massflow controller calibrated in a reference state is set at a plurality of predetermined flow volumes.